

## Food preference studies of the larger bandicoot rat, *Bandicota indica* (Bechstein)

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**Abstract.** The food preferences of the South-Asian commensal rat, *Bandicota indica* were studied to evolve a suitable bait for control. Amongst cereals clear preference towards rice in its whole/divided form was evident. Amongst additives 7-10% groundnut oil enhanced bait intake significantly while 2% salt and sugar did not influence the rat's diet choice. The results indicate whole/broken rice mixed with 7-10% groundnut oil as the most attractive bait for poisoning *B. indica*.

**Keywords.** Food preferences; cereals; pulses; oils; calorie intake; best bait; *Bandicota indica*.

### 1. Introduction

The larger bandicoot rat, *Bandicota indica* (Bechstein) is widely distributed in Burma, Vietnam, Thailand, Indonesia, Formosa, Hongkong and almost the whole of India. Unlike the field and forest inhabiting lesser bandicoot rat, *Bandicota bengalensis*, the larger bandicoot is commensal, living close to buildings, gardens, stables and out houses. To a small extent it is reported to inhabit the warehouses of Calcutta (Spillet 1968). Though no match to the number and extent of infestation of house rat (*Rattus rattus*), larger bandicoots do become as commensal as the former, particularly in South India. They are omnivorous depending on domestic refuse, grains and vegetables and occasionally attack poultry. Much damage is inflicted by the species to ground, flooring and crop by their burrowing habits. Its ecology and biology are known to a very small extent (Spillet 1968; Arjunwadkar and Gadgil 1974). The effective control of *B. indica*, as in the case of other rodent pests, necessitates formulation of highly attractive and specific baits as poison carriers. In this paper we describe its food preferences based on laboratory experiments.

### 2. Material and methods

#### 2.1 Subjects

*Bandicota indica* were trap collected at Hesaraghatta and brought to laboratory. They were confined singly in metal cages and fed on *ad lib* quantities of standard rat and mouse feed and water prior to food preference tests.

#### 2.2 Feeding tests

Except for four cereals tested individually as single choice tests, the rest of the experiments were in the nature of multiple choice tests with a maximum of five and

minimum of three candidate baits. In each test 50 g of candidate foods were offered each day and consumptions recorded 24 hrs later. Grain spilled outside the cages were collected and deducted from this to arrive at exact amounts eaten. Each test ran for seven continuous days. The scheme of tests was as follows: Test I to IV—single choice of cereals; Test V—multiple choice of cereals; Test VI—multiple choice of pulses; Test VII—texture preference of best liked cereal; Test VIII to X—different concentrations of groundnut, coconut and gingilly oil mixed with broken rice; Text XI—oil preference; Text XII—addition of 2% sugar and salt on bait intake; Test XIII—best bait composition arrived at *vs* plain rice *vs* plain wheat.

### 2.3 *Statistics*

Daily consumptions were converted to g consumed/100 g body weight and their means with standard error computed. In multiple choice tests percent consumption of each candidate diet were compared. Preferential order of bait acceptancy (ranks) was established after conducting Kruskal-Wallis one way analysis of Variance (Seigel 1956).

The calorie equivalents of foods consumed were calculated and compared during the various choice tests. Student 't' tests were performed to compare the highest and lowest calorie ingested during tests as well as to compare average daily intake of food during single and multiple choice tests of cereals.

## 3. **Results**

### 3.1 *Cereal and pulse preference*

The mean daily intake of rice, ragi, jowar and wheat was not significantly different from each other during single choice test (table 1). The larger bandicoot rat ate 3-4 g of the given cereal/100 g body weight/day. However, the animal exhibited preferential order of cereal intake during multiple choice test only. This order was rice > jowar > wheat > maize > ragi (table 1). Similarly the order of pulse intake was groundnut > greengram > cowpea > field bean (table 1).

### 3.2 *Texture preference*

Whole grain and broken form were preferred to rice in powder form (table 1).

### 3.3 *Oil preference*

The order of consumption of different concentrations of groundnut oil was 10% > 7% > 1% > 3% > 5%, that of coconut oil was 10% > 7% > 5% > 3% > 1% and gingilly oil was liked in the order of 10% > 7% > 1% > 3% > 5%. Amongst the three oils the preference was groundnut > gingilly > coconut (table.1).

### 3.4 *Additives*

Addition of salt and sugar at 2% did not affect the rate of bait consumption in larger bandicoots (table 1).

### 3.5 *Best bait composition arrived at vs rice vs ragi*

The bait composition arrived at after the various preference tests namely cracked

rice + 10% groundnut oil was definitely consumed more than plain cereals *viz.* rice and wheat (table 1).

### 3.6 Calorie intake

The mean calorie intake during the different food tests did not differ significantly and varied from  $13.34 \pm 0.24$  to  $26.65 \pm 5.23$  calories (table 2).

### 3.7 Single and multiple choice test

Although the rate of consumption did not differ in the two types of choice test ( $p < 0.2$ ), the preferential order was evident only in the multiple choice test (table 1).

## 4. Discussion

### 4.1 Bait preference

In all the 13 tests conducted involving various foods and additives, the rats sampled considerable amount of all foods in addition to the large quantity of preferred food. Amongst the cereals rice was the most liked as in the case of lesser bandicoot rat, *Bandicota bengalensis* (Harrison and Woodville 1950; Sridhara and Krishnamoorthy 1968). Amongst pulses groundnut was preferred to the others. Rice either as whole cereal or in cracked form was preferred to flour form, an observation contrary to the preferential consumption of finely divided/powder form of cereals by majority of the rodents (Khan 1974; Jain *et al* 1974; Prakash *et al* 1975). Only *Rattus cutchicus* is known to exhibit a similar taste for whole/cracked cereal (Jain *et al* 1975). Even

**Table 2.** Comparison of calorie intake during different choice tests.

Choice tests for	Total calorie intake/100 g $\pm$ S.E.
1. Cereals : a) Single choice — rice	13.34 $\pm$ 0.24
ragi	13.94 $\pm$ 0.49
jowar	13.37 $\pm$ 0.28
wheat	13.7 $\pm$ 0.28
b) Multiple choice	14.65 $\pm$ 2.72
2. Pulses	19.57 $\pm$ 3.06
3. Different textures of rice	15.87 $\pm$ 3.59
4. Different concentrations of groundnut oil in cracked rice	24.42 $\pm$ 4.95
5. Different concentrations of coconut oil in cracked rice	17.89 $\pm$ 3.58
6. Different concentrations of gingilly oil in cracked rice	20.34 $\pm$ 3.96
7. Cracked rice with 10% groundnut oil <i>vs</i> same with 10% coconut oil <i>vs</i> same with 10% gingilly oil	19.71 $\pm$ 4.31
8. Cracked rice with 10% groundnut oil <i>vs</i> same plus 2% sugar <i>vs</i> same with 2% salt	25.65 $\pm$ 6.23
9. Cracked rice with 10% groundnut oil (best bait arrived at) <i>vs</i> rice <i>vs</i> wheat	19.09 $\pm$ 2.82

Table 1. Bait preference of *B. indica*.

Bait choice	A.D.I. $\pm$ S.E. (g/100g)	Percent eaten	Preferential rank
<i>Cereals—single choice</i>			
I. Rice	3.88 $\pm$ 0.07	—	—
II. Ragi	4.25 $\pm$ 0.15	—	—
III. Jowar	3.83 $\pm$ 0.08	—	—
IV. Wheat	3.96 $\pm$ 0.08	—	—
<i>V. Cereals—multiple choice</i>			
a) Rice	2.25 $\pm$ 0.34	52.8	1
b) Ragi	0.39 $\pm$ 0.09	9.2	4
c) Jowar	0.76 $\pm$ 0.22	17.8	2
d) Maize	0.37 $\pm$ 0.06	8.7	3
e) Wheat	0.49 $\pm$ 0.08	11.5	3
<i>VI. Pulses</i>			
a) Green Gram	1.66 $\pm$ 0.49	36.4	2
b) Cowpea	0.78 $\pm$ 0.05	17.1	3
c) Field bean	0.08 $\pm$ 0.03	1.75	4
d) Groundnut	2.04 $\pm$ 0.21	44.7	1
<i>VII. Particle size of most preferred cereal (rice)</i>			
a) Whole	1.62 $\pm$ 0.26	35.2	1
b) Cracked	2.25 $\pm$ 0.39	48.9	1
c) Flour	0.73 $\pm$ 0.18	15.9	2
<i>VIII. Oil preference: different concentrations of groundnut oil with cracked rice</i>			
a) 1%	1.32 $\pm$ 0.34	21.6	5
b) 3%	0.88 $\pm$ 0.23	14.3	4
c) 5%	0.65 $\pm$ 0.17	10.5	3
d) 7%	1.46 $\pm$ 0.18	23.7	2
e) 10%	1.85 $\pm$ 0.35	29.9	1
<i>IX. Oil preference: different concentrations of coconut oil mixed with cracked rice</i>			
a) 1%	0.18 $\pm$ 0.15	4.1	5
b) 3%	0.29 $\pm$ 0.13	6.7	4
c) 5%	0.46 $\pm$ 0.15	10.6	3
d) 7%	1.56 $\pm$ 0.18	36.0	2
e) 10%	1.85 $\pm$ 0.29	42.6	1
<i>X. Oil preference: different concentrations of gingilly oil mixed with cracked rice</i>			
a) 1%	0.90 $\pm$ 0.3	17.7	3
b) 3%	0.61 $\pm$ 0.13	12.0	4
c) 5%	0.65 $\pm$ 0.09	12.7	4
d) 7%	1.18 $\pm$ 0.18	23.2	2
e) 10%	1.75 $\pm$ 0.31	34.4	1
<i>XI. Oil preference: 10% groundnut vs 10% coconut vs 10% gingelly oil mixed with cracked rice</i>			
a) Groundnut	2.14 $\pm$ 0.35	47.2	1
b) Coconut	0.92 $\pm$ 0.16	20.3	3
c) Gingilly	1.47 $\pm$ 0.46	32.5	2
<i>XII. Effect of sugar and salt on bait intake</i>			
a) Plain bait	1.28 $\pm$ 0.31	27.7	—
b) Bait + 2% sugar	1.56 $\pm$ 0.46	33.7	—
c) Bait + 2% salt	1.79 $\pm$ 0.29	38.6	—
<i>XIII. Best bait composition vs rice vs wheat</i>			
a) Best bait	2.57 $\pm$ 0.25	52.9	1
b) Rice	1.21 $\pm$ 0.29	24.9	2
c) Wheat	1.08 $\pm$ 0.21	22.2	2

Values are mean of 20 observations  $\pm$  S.E.

larger-sized cereals like jowar, maize and wheat were consumed more by *B. indica* than small-sized ragi.

#### 4.2 Single and multiple choice test

The average daily intake of food was not different in single and multiple choice test although Bindra and Sagar (1970) reported higher intakes during multiple choice test in *Rattus meltada*, *Tatera indica* and *Bandicota bengalensis* and Prakash *et al* (1975) observed lower rates of food intake under similar conditions for *Gerbillus gleadowii*. However, no significant variation was detected in food intake between single and multiple choice tests for *Rattus rattus* (Krishnamurthy *et al* 1967; Deoras 1968), *Mus musculus* (Krishnamurthy *et al* 1967) and *Rattus meltada* (Jain *et al* 1974).

#### 4.3 Additives

Of the three oils tested addition of 10% groundnut oil to the bait enhanced consumption more than the other oils. Similar enhancement of bait intake due to addition of vegetable oils has been reported for black rats by Khan (1974) and for desert gerbils by Prakash *et al* (1969).

Although sugar/saccharin addition elevated the levels of food ingestion in house and Norway rats (Khan 1974; Barnett and Spencer 1953), Prakash *et al* (1975) did not observe any such trend when 2% salt/sugar was added to the diet of *Gerbillus gleadowii*. Similarly *B. indica* did not show any significant liking towards food containing salt/sugar.

#### 4.4 Calorie intake

Like other mammals *B. indica* also regulated its calorie intake depending on the energy value of food. The mean calorie intake did not vary significantly during the different choice tests.

### 5. Conclusions

From the results and discussion it is evident that broken rice mixed with 10% groundnut oil can be effectively used as bait for controlling the larger bandicoot rat, *Bandicota indica*.

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